

analyse pairs of audio signals where there are at least two audio signals with the same segment class at the same time. The number of analyses to be applied for a media segment depends on the amount of different classes within the overlapping class segment. For example, if only music segments are present within the overlapping class segment, then music based analysis is applied for each media segment. However, if the overlapping class segment contains 2 or more different classes (that is, one media segment may get assigned to 'music' whereas the some other media segment may get assigned to 'non-music'), then the same number of analyses are applied to each media segment regardless whether a particular class was assigned initially to the media segment or not. The class signal structure analysis results can then be passed to the pairwise difference analyser 209.

[0132] Thus for example with respect to the audio signals shown in FIG. 8 the timeline comprises 3 overlapping class segments. These overlapping class segments are the time period from t_1 - t_2 , t_2 - t_3 , and t_3 - t_4 . The first overlapping class segment from t_1 - t_2 comprises part of audio signal A 501 non-music segment 701 and audio signal B 503 non-music segment 711 and is analysed by the non-music signal structure analyser 221. The non-music signal structure analyser 221 can be configured to analyse these of audio signals and pass the results to the pairwise difference analyser 209.

[0133] The second overlapping class segment from t_2 - t_3 comprises part of audio signal A 501 music segment 703, part of audio signal B 503 music segment 713 and audio signal C 505 music segment 723 and is analysed by the music signal structure analyser 223. The music signal structure analyser 223 can be configured to analyse these of audio signals and pass the results to the pairwise difference analyser 209.

[0134] The third overlapping class segment from t_3 - t_4 comprises a latter part of audio signal A 501 music segment 703, and a latter part of audio signal B 503 music segment 713 and is analysed by the music signal structure analyser 223. The music signal structure analyser 223 can be configured to analyse these of audio signals and pass the results to the pairwise difference analyser 209.

[0135] In some embodiments the signal structure analysers, such as the non-music signal structure analyser 221 and the music signal structure analyser 223 are configured to analyse the audio signal segments on a frame by frame (or sub-frame by sub-frame) basis, and for each frame (or sub-frame) determine at least one possible class based feature or parameter value. In such embodiments the class based at least one feature or parameter has values which can then be compared to determine differences within the pairwise difference analyser 209.

[0136] In some embodiments the class based at least one feature or parameter value for a frame can be the same values which were used by the content classifier to define the classes. For example a classifier which can be used in some embodiments is the one described in "Features for Audio and Music Classification" by McKinney and Breebaart. Proc. 4th Int. Conf. on Music Information Retrieval, which is configured to determine classifications such as Classical Music, Jazz, Folk, Electronics, R&B, Rock, Reggae, Vocal, Speech, Noise, and Crowd Noise.

[0137] The analysis features can in some embodiments be any suitable features such as spectral features such as cepstral coefficients, frequency warping, magnitude warping, Mel-frequency cepstral coefficients, spectral centroid, bandwidth, temporal features such as rise time, onset asynchrony at dif-

ferent frequencies, frequency modulation (amplitude and rate), amplitude modulation (amplitude and rate), zero crossing rate, short-time energy values, etc.

[0138] It would be understood that in some embodiments a first class signal structure analyser can be configured to generate or determine a first set of features or parameters while a second class signal structure analyser can be configured to generate or determine a second set of features or parameters. In some embodiments the first set of features overlaps at least partially the second set of features.

[0139] For example for the 'music' class the music class dependent analysis can comprise any suitable music structure analysis techniques. For example, in some embodiments the bars (or beats) of a music segment are determined and compared.

[0140] In some embodiments the signal structure analysers are configured to filter the feature or parameter values determined by the content classifier 203 and pass the filtered feature or parameter values to the pairwise difference analyser 209.

[0141] The operation of generating class based structure analysis is shown in FIG. 4 by step 309.

[0142] In some embodiments the content coordinating apparatus comprises a pairwise difference analyser 209.

[0143] The pairwise difference analyser 209 can be configured in some embodiments to receive the signal structure analysis results and pairwise analyse these to determine differences which are passed to an event space assigner 211. In some embodiments the pairwise difference analyser 209 is configured to perform a decision based on the difference to determine whether the pairwise selection is similar or not. In other words the pairwise difference analyser can be configured to compare on an audio signal or media segment pairwise manner to determine whether the signal structure analysis results are similar enough (indicating same event space) or not (indicating different event space).

[0144] The operation of generating pairwise media structure difference is shown in FIG. 4 by step 311.

[0145] In some embodiments the comparison is applied with respect to the other audio signals or media segments within the same overlapping class segment.

[0146] In other words the class structure differences in some embodiments can be combined.

[0147] The operation of combining class structure differences is shown in FIG. 4 by step 313.

[0148] The analysis comparison can in some embodiments be configured to return a binary decision value 0 or 1 which can be then summed across all applied analyses classes.

[0149] For example with respect to the music segments and where the feature value is bar or beat times where the difference in bar or beat times is too great (for example in the order of a second or more), the media in the pair are not similar and a binary decision of similarity of 0 is generated, and where the difference is less than the determined value (for example one second) then a binary decision of similarity of 1 is generated.

[0150] The content coordinating apparatus can in some embodiments comprise an event space assigner 211. The event space assigner 211 can be configured to receive the output of the pairwise difference analyser (for example the similarity binary decision or the difference values combined) and then determine whether the media pairs or audio signals are similar enough to be assigned to the same event space or not.